

Topic #2

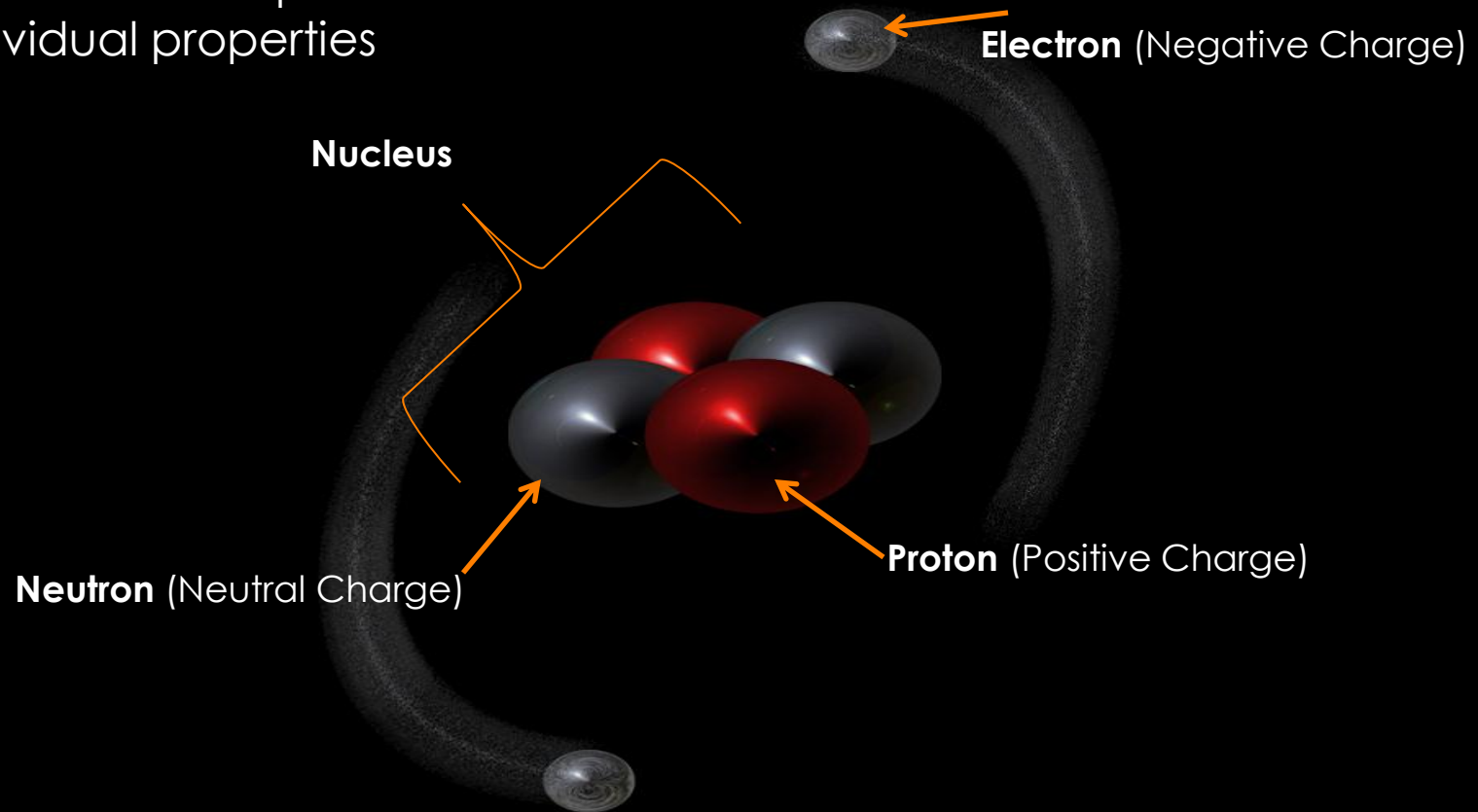
The Chemistry of Life

Topic Question

- What are the basic chemical principles that affect living things?

The Nature of Matter

Atom = smallest unit of matter that keeps individual properties



Elements and Isotopes

- An **element** is a pure substance that consists entirely of one type of atom.
 - > Carbon (C), Hydrogen (H), Nitrogen (N), Oxygen (O) and Phosphorus (P) are the most important elements to life.

Elements and Isotopes

- Does the number of protons and element has have anything to do with the number of electrons and neutrons it has? Why?

Elements and Isotopes

- **Isotopes** are atoms of the same element that have a different number of neutrons.
- Is an isotope as stable as a normal atom of the same element?

Elements and Isotopes

- Can two atoms of the same element have a different number of protons?
- Can two atoms of the same element have a different number of electrons?

Chemical Compounds

- ◉ Which of the following are chemical compounds and how do you know?
 - > NaCl
 - > H₂O
 - > Au
 - > C₆H₁₂O₆

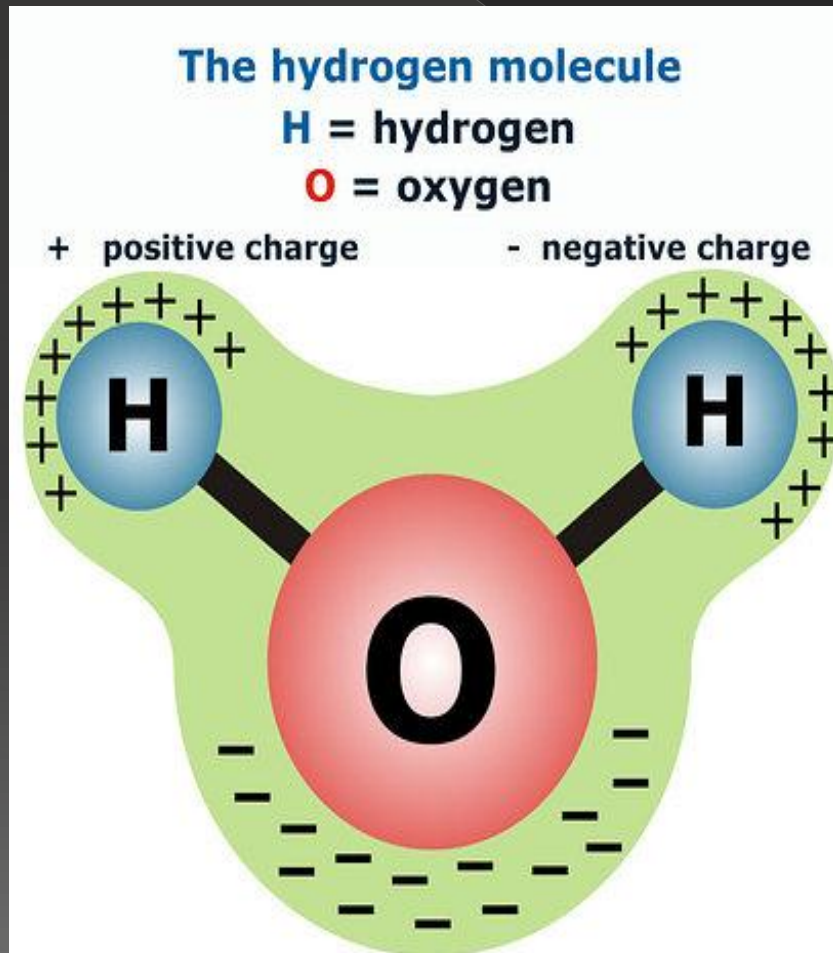
Chemical Compounds

- ⦿ How are these compounds held together?
- ⦿ Types of bonds:
 - > Ionic Bond –
 - > Covalent Bond-

Atomic Attraction

- Atoms and compounds are made up of charged particles and these charges will at different times and for different reasons have an uneven layout around the atom.
- This uneven layout will cause attraction and repulsion between atoms and compounds.
- These forces **between** atoms and compounds are called Van der Waals Forces.

Water



- The uneven charge seen on the diagram is a result of the larger oxygen molecule pulling the electrons from the hydrogen closer to its nucleus.
- This is called **polarity**.

Water

- This uneven sharing of electrons results in a **Van der Waals Force** called **HYDROGEN BONDING**.
 - > Even though its not really a bond.

Water

- Hydrogen bonding gives water some really interesting and important abilities.
- **Define** cohesion and adhesion and give an **example** of these abilities in action.

Solutions and Suspensions

- Define the following terms:

- > Mixture

- > Solution

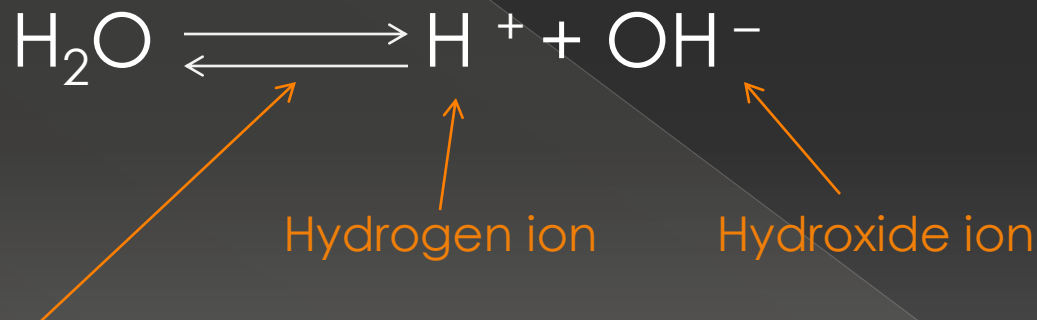
- > Solute

- > Solvent

- > Suspension

Acids, Bases and pH

- When a water molecule is pulled apart you have the following reaction.



This symbol means the solution is in equilibrium

- Why do two differently charged ions result from the split?

Acids, Bases and pH

- Pure water has equal concentrations (amounts) of hydrogen and hydroxide ions.
- If there is a **greater** concentration of **hydrogen ions** then the solution is considered an **acid**.
- **Greater hydroxide** concentration is a **base**.

Acids, Bases and pH

- Scientists measure this difference in concentration with the **pH Scale**.



Acids, Bases and pH

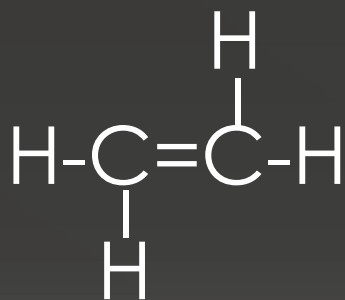
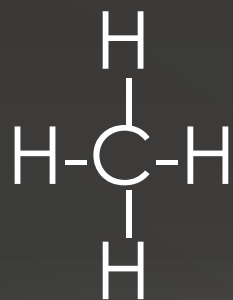
- Define the following terms and give an example of each:
 - > Acid
 - > Base
 - > Buffer

Carbon

- ◉ Where is carbon on the periodic tabel?
- ◉ How many protons, neutrons and electrons does it have?
- ◉ Why does this make carbon a valuable element to living things?

Carbon Bonds

- Carbon can form molecules containing single, double and triple bonds.



Carbon Compounds

- Small compounds which has certain chemical properties is called a **monomer**.
- These monomers are linked together to form larger molecules with different chemical properties called **polymers**.

Carbon Compounds

- Define each of the following macromolecules, name the monomer of each and give an example of each:
 - > Protein
 - > Carbohydrate
 - > Nucleic Acid
 - > Lipid

Chemical Reactions and Enzymes

- A **chemical reaction** is a process that changes or transforms one set of chemicals into another.
- The chemical bonds that join atoms and compounds are changed during a chemical reaction.

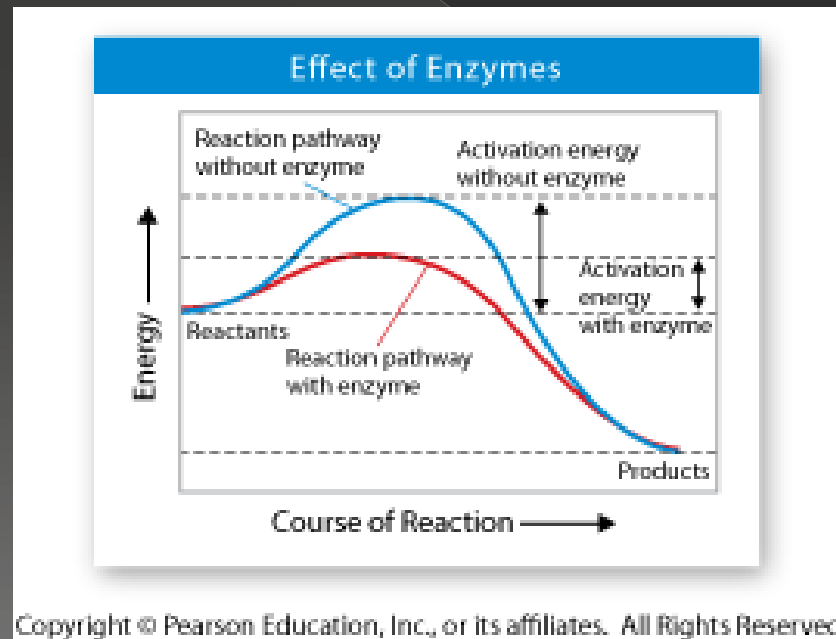


Chemical Reactions and Enzymes

- All reactions need to absorb energy to begin.
- The amount of energy the reaction needs to start is called **activation energy**.
- In some cases this energy may be very high.

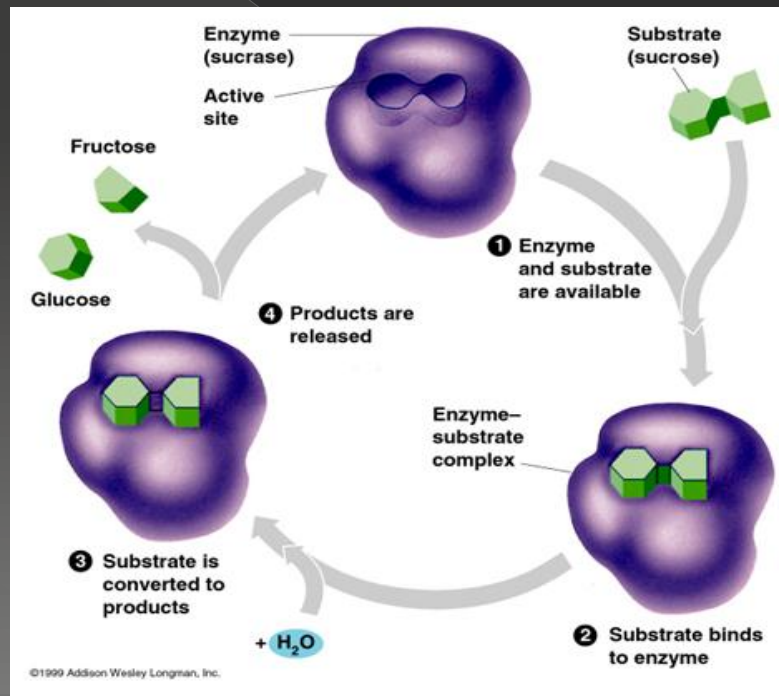
Chemical Reactions and Enzymes

- A **catalyst** will lower the amount of energy needed to get started and this will speed up the rate of reaction.



Enzyme Substrate Complex

- Enzymes have a specific shape and will only work with a compound aka **substrate** that has a shape which fits its active site.



Enzyme Substrate Complex

- ◉ If an enzymes shape is changed it can no longer work in the same reactions.
- ◉ Temperature, pH and regulatory molecules can affect the shape and activity of enzymes.
- ◉ HOMEOSTASIS!!!